TECHNICAL MEMORANDUM 1363

PROPAGATION TEST OF PROPOSED EXPLOSIVE TRAIN FOR FUZE, MT, XM563

JACK BROTHERS

DA PROJECT 1C542709D367

AMCMS 5545.12.54208

COPY 52 OF 53

FEBRUARY 1964

PICATINNY ARSENAL
DOVER, NEW JERSEY

NOTICE: When government or other drawings, specifications or other data are used for any purpose other than in connection with a definitely related government procurement operation, the U. S. Government thereby incurs no responsibility, nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

TECHNICAL MEMORANDUM 1363

PROPAGATION TEST OF PROPOSED EXPLOSIVE TRAIN FOR FUZE, MT, XM563

BY

JACK BROTHERS

FEBRUARY 1964

REVIEWED BY W A Schuster
W. A. SCHUSTER
Chief, Fuze Section

APPROVED BY E H Buchanan
E. H. BUCHANAN
Chief, Artillery
Ammunition Laboratory

AMMUNITION ENGINEERING DIRECTORATE
PICATINNY ARSENAL
DOVER, NEW JERSEY

TABLE OF CONTENTS

SUMMARY

An explosive train utilizing the M46 Stab Detonator instead of the T37 Stab Detonator was proposed for use with the Fuze, MT, XM563. The fuze will be used with field artillery Beehive type ammunition. Propagation tests were conducted to evaluate the output and establish the reliability of the proposed explosive train.

Of the 193 fuzes tested, all propagated satisfactorily -- producing a hole about ½-inch in diameter in mild steel plate 0.051 inches thick.

The indicated reliability of the explosive train is 98.48% at a 95% confidence level.

CONCLUSIONS

The proposed explosive train performs satisfactorily within the temperature range from -65°F to +160°F.

The lead cup assembly is capable of producing a hole about ½-inch in diameter in mild steel plate 0.051 inches thick.

RECOMMENDATION

It is recommended that the proposed explosive train be adopted for use in Fuze, MT, XM563.

INTRODUCTION

The objective of this project was to establish the feasibility of the explosive train proposed for Fuze, MT, XM563, which will be used with field artillery Beehive type ammunition.

The proposed explosive train (Figure 1), includes an M46 Stab Detonator instead of a T37 Stab Detonator used in a previous design. Use of the M46 Detonator, which is considerably shorter than the T37 Detonator, provides room for additional mechanisms in the nose of the fuze.

Modified M564 Fuzes were used to simulate the proposed explosive train in the XM563 Fuze. Static propagation tests were conducted to evaluate output and establish reliability.

STUDY

To produce the test fuze, M564 Fuzes were modified to test the explosive train shown in Figure 2 (Sketch DR5-231) proposed for Fuze, MT, XM563.

The nose section of the M564 Fuze was modified to provide a means of initiating the M46 Detonator statically. To accomplish this the depth of the detonator cavity in the adapter (X10520262) was increased to meet the design requirement of 2.5 inches maximum distance between the output end of the M46 Detonator and the sensitive end of the M7 Relay in the closing plug. A spacer (DR5-227) then was designed to occupy the space above the detonator in the detonator cavity. To permit initiation of the M46 Detonator by external means the detent safety mechanism assembly was omitted from the head and, in addition, the head was modified by drilling the firing pin assembly cavity all the way through. Converter (DR5-228) was designed to occupy the detent safety mechanism cavity as well as the firing pin cavity. An axial hole in the converter was included to permit use of a firing pin (DR5-229) for initiating the M46 Detonator. A sectioned model of the test fuze is shown in Figure 3.

The following groups of test fuzes were conditioned for a minimum of 18 hours just before testing: 50 at +160°F, 50 at testing room temperature (72°F), and 93 at -65°F.

The test setup is shown in Figure 4. The test fuze was placed on a 0.051-inch thick mild steel plate. Damage to the plate was used as a basis for evaluating the output of the test fuze. A one-pound weight was dropped five inches to impact the firing pin.

All fuzes performed satisfactorily. There were no misfires or low order functions. No unusual events occurred.

A functioned fuze and typical output test plates are shown in Figures 5 and 6.

The total quantity of fuzes tested was used as the sample size for establishing the indicated reliability 98.48% at a 95% confidence level.

Although it is not part of this test, it should be noted that the use of the M7 Relay in new fuze designs is discouraged. This is because the M7 Relay is open-faced; that is, there is no covering over the lead azide. It has been proven that the lead

azide in the M7 Relay can flake or crumble (Reference 1); thus there is a possibility of loose lead azide getting into the fuze mechanism. This condition is considered dangerous and could cause prematures. The XM10 Explosive Relay is one explosive train element which can be considered as a replacement for the M7 Relay.

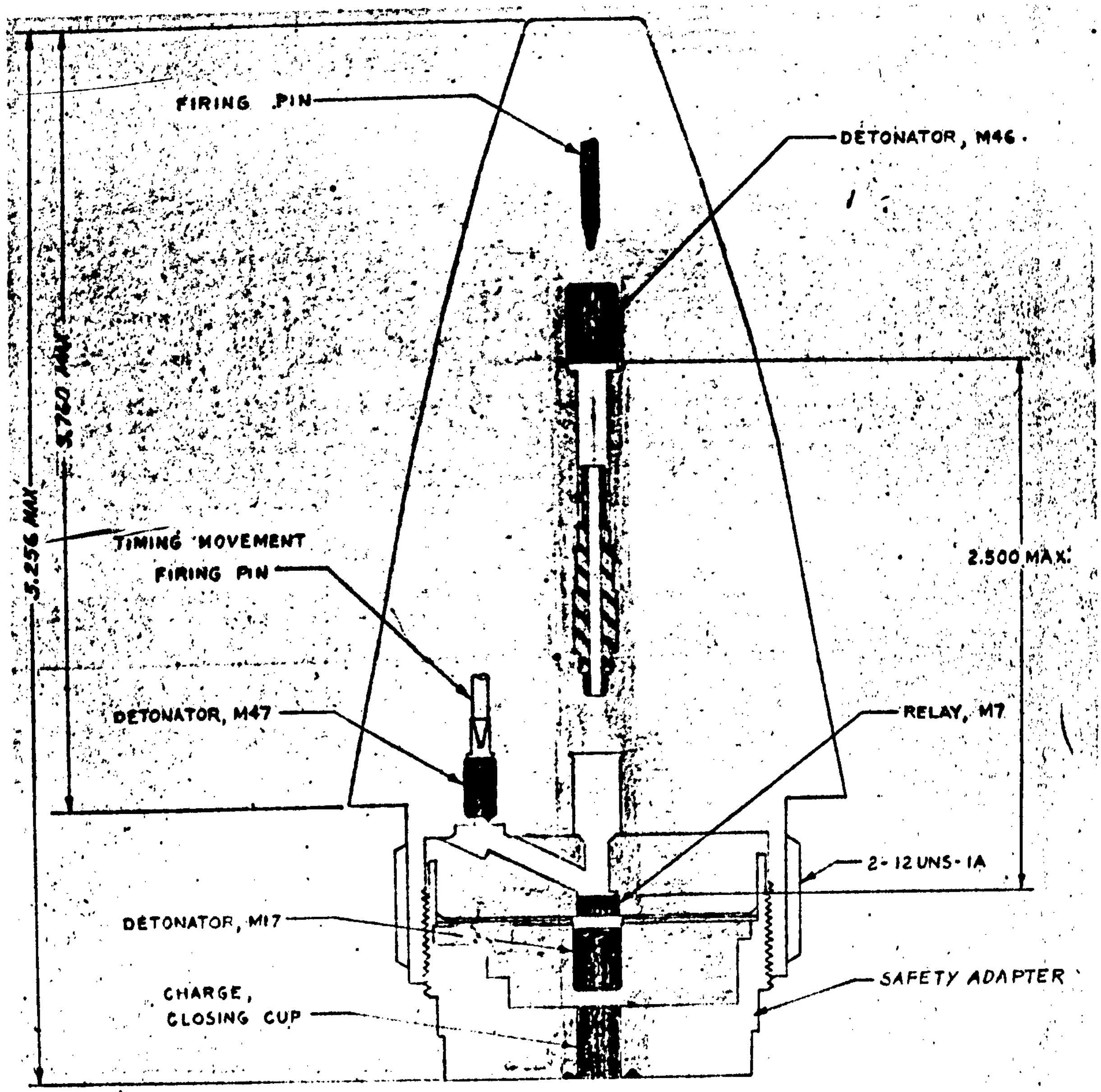
REFERENCE

1. Picatinny Arsenal Technical Report 2418, Evaluation of the NOL 60 Primer Mixture for Use in the M29A1 Percussion Primer, Page 7, Paragraph 23, July 1957.

APPENDIX

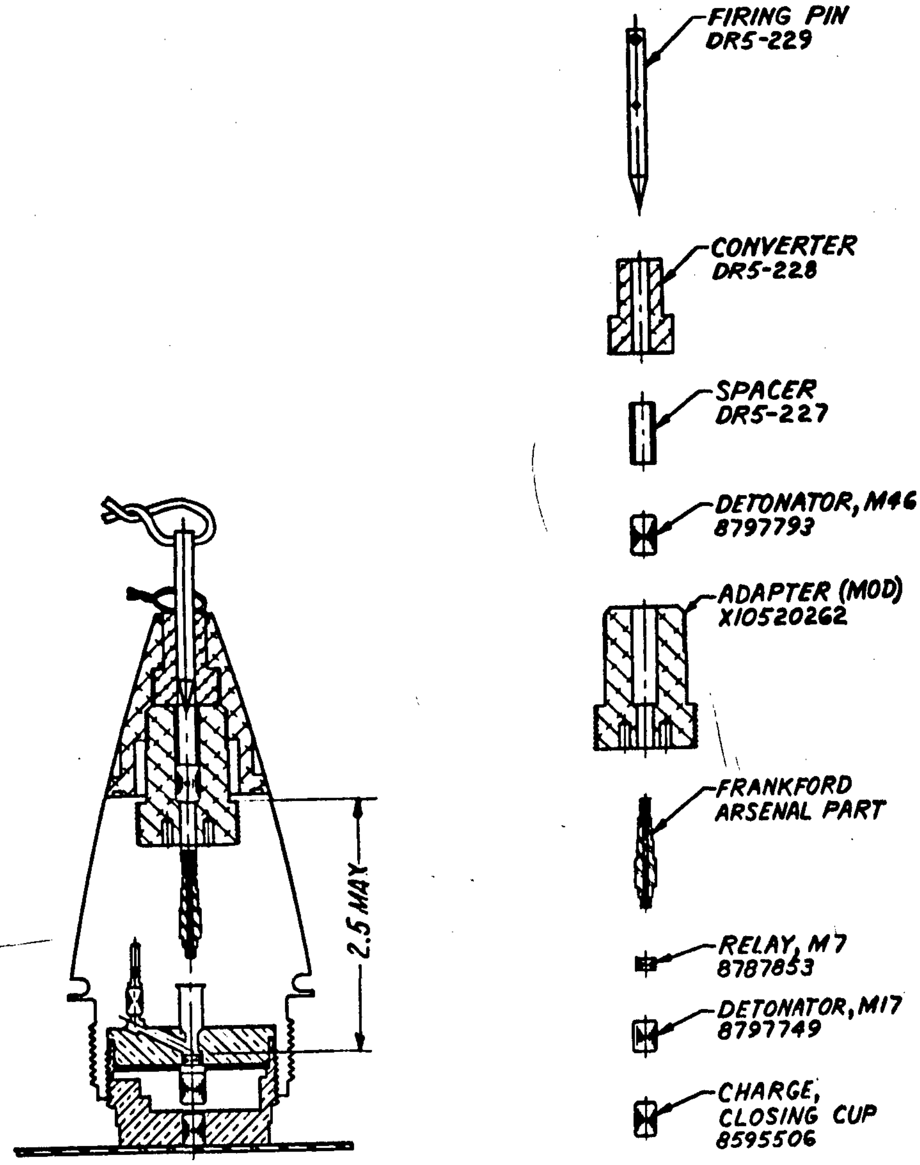
APPENDIX A

FIGURES



PROPOSED XM 563 FUZE EXPLOSIVE TRAIN
WITH M 46 DETONATOR
AND XM 548 SAFETY ADAPTER
FOR LABORATORY TESTS
FIGURE 1

26 MARCH 1963



PROPAGATION TEST FUZE (XM548 MODIFIED) FOR PROPOSED XM563 FUZE WITH M46 DETONATOR IN PD ASSEMBLY

FUZE SECTION

ARTY AMMO LAB. PICATINNY ARSENAL

DRAWN BY:	DATE: 17 APR 63
REVIEWED BY:	SKETCH NO. DR5-231

Figure 2

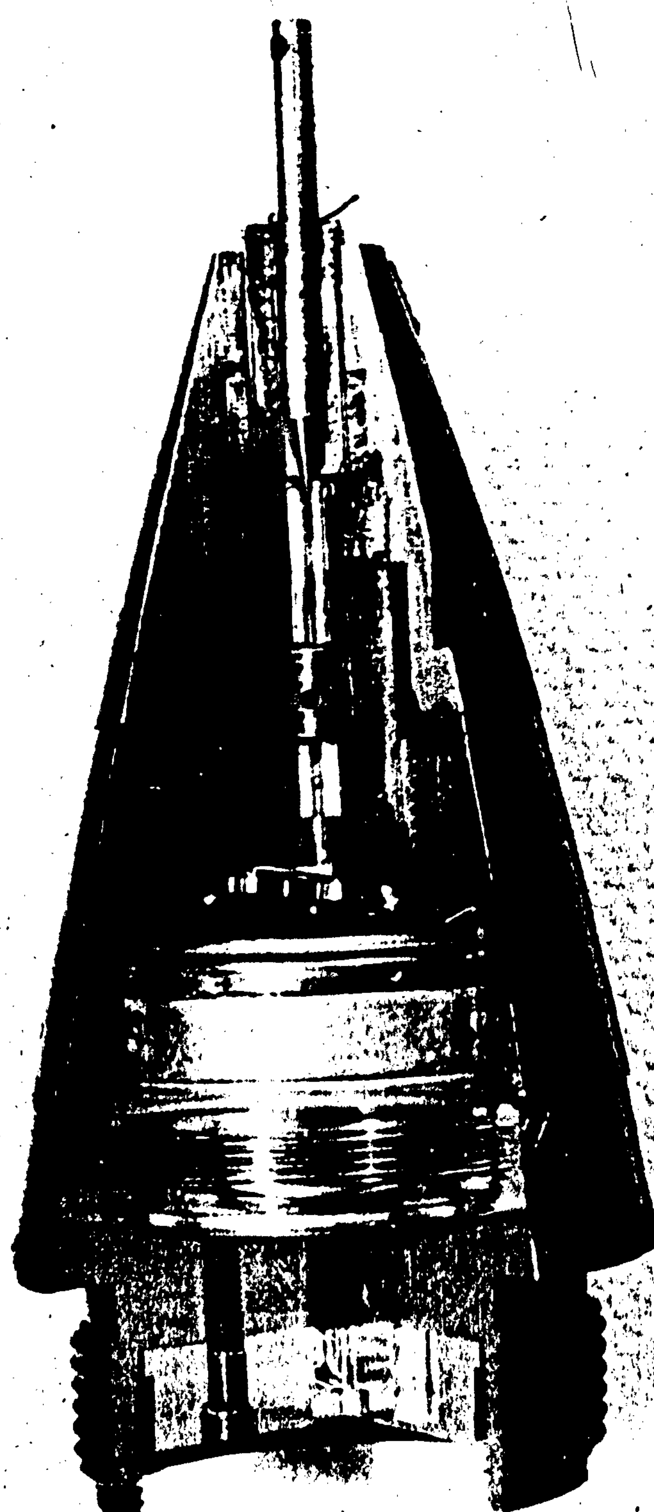


Figure 3

Figura 4

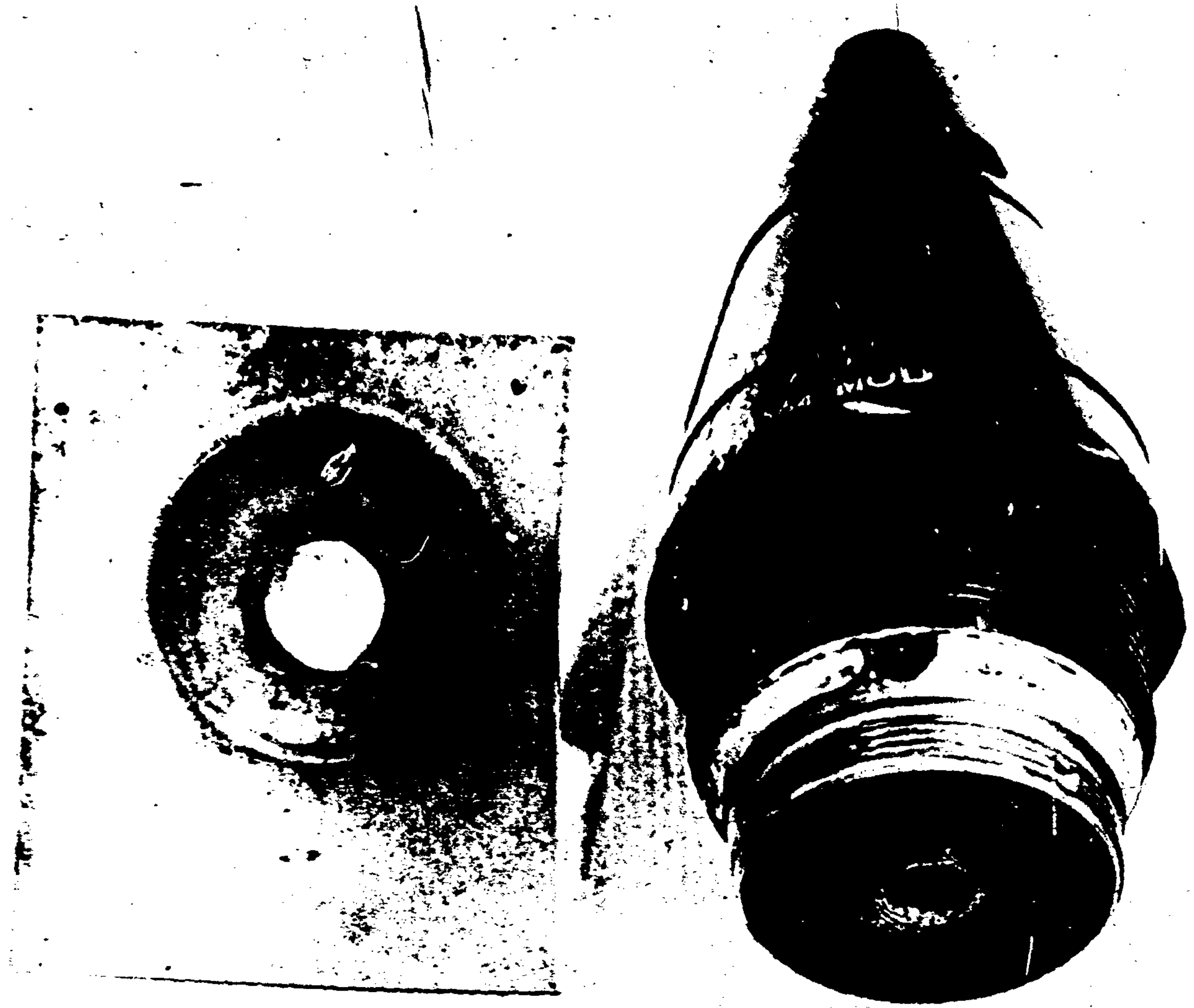


Figure 5

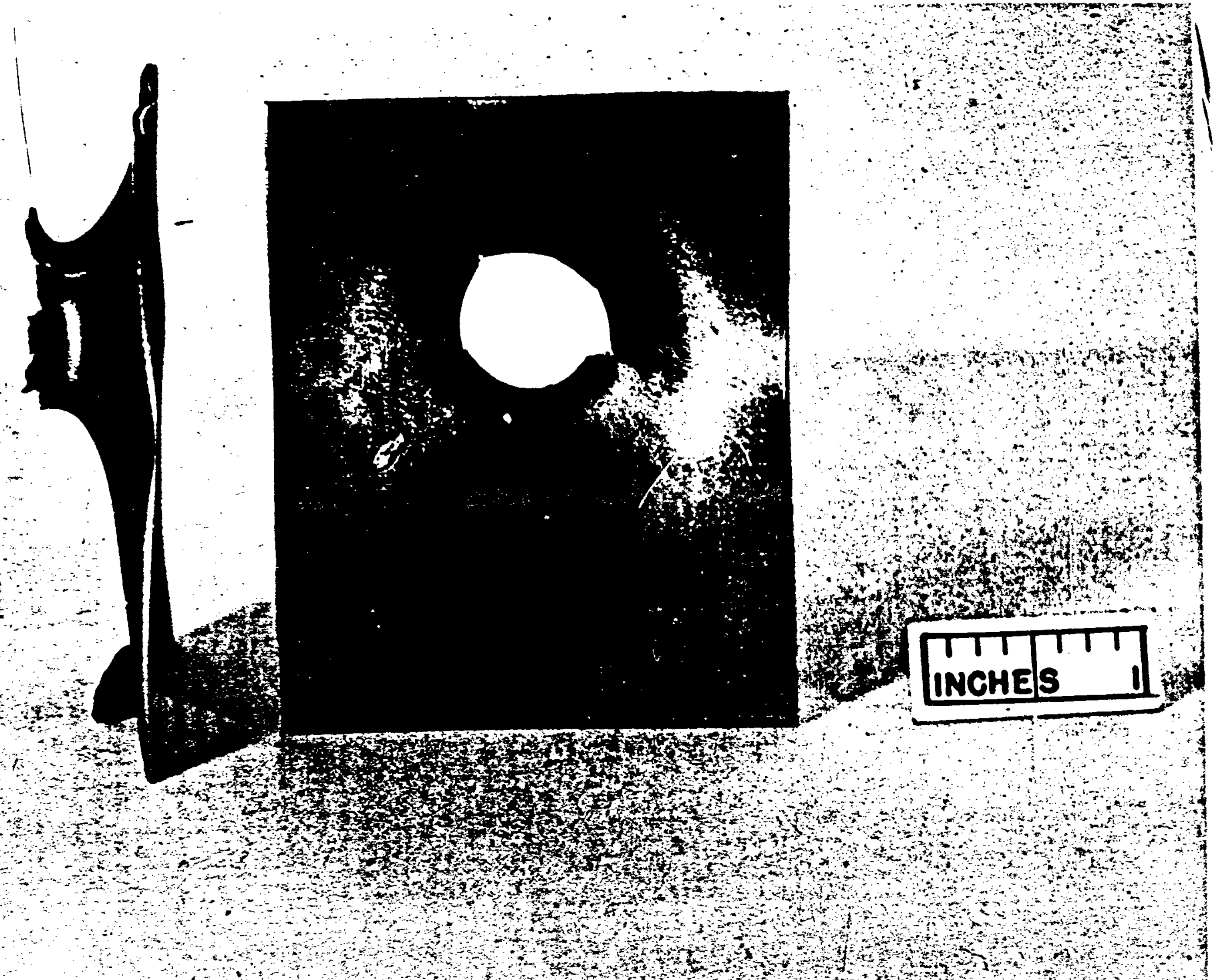


Figure 6

ABSTRACT DATA

ABSTRACT

Accession No. ______________ AD ______________

Picatinny Arsenal, Dover, New Jersey

PROPAGATION TEST OF PROPOSED EXPLOSIVE TRAIN FOR FUZE, MT, XM563

Jack Brothers

Technical Memorandum 1363, February 1964, 13 pp, figures. Unclassified report from the Artillery Ammunition Laboratory, Ammunition Engineering Directorate.

An explosive train utilizing the M46 Stab Detonator instead of the T37 Stab Detonator was proposed for use with the Fuze, MT, XM563. The fuze will be used with field artillery Beehive type ammunition. Propagation tests were conducted to evaluate the output and establish the reliability of the proposed explosive train.

The proposed explosive train performs satisfactorily within the temperature range from -65° to +160°F.

UNCLASSIFIED

1. Fuze -- Explosive Train

I. Propagation Test of Proposed Explosive Train for Fuze, MT, XM563

II. Brothers, J.

UNITERMS

M46 Stab Detonator
T37 Stab Detonator
Fuze, MT, XM563
M564 Fuze
M7 Relay
Propagation Test
Explosive Train
Lead Cup Assembly
Lead Azide
Brothers, J.

Accession No. ______________ AD ______________

Picatinny Arsenal, Dover, New Jersey

PROPAGATION TEST OF PROPOSED EXPLOSIVE TRAIN FOR FUZE, MT, XM563

Jack Brothers

Technical Memorandum 1363, February 1964, 13 pp, figures. Unclassified report from the Artillery Ammunition Laboratory, Ammunition Engineering Directorate.

An explosive train utilizing the M46 Stab Detonator instead of the T37 Stab Detonator was proposed for use with the Fuze, MT, XM563. The fuze will be used with field artillery Beehive type ammunition. Propagation tests were conducted to evaluate the output and establish the reliability of the proposed explosive train.

The proposed explosive train performs satisfactorily within the temperature range from − 65° to + 160°F.

UNCLASSIFIED

1. Fuze – Explosive Train
I. Title
II. Brothers, Jack

UNITERMS

M46 Stab Detonator
T37 Stab Detonator
Fuze, MT, XM563
M564 Fuze
M7 Relay
Propagation Test
Explosive Train
Lead Cup Assembly
Lead Azide
Brothers, J.

UNCLASSIFIED

Accession No. ______________ AD ______________

Picatinny Arsenal, Dover, New Jersey

PROPAGATION TEST OF PROPOSED EXPLOSIVE TRAIN FOR FUZE, MT, XM563

Jack Brothers

Technical Memorandum 1363, February 1964, 13 pp, figures. Unclassified report from the Artillery Ammunition Laboratory, Ammunition Engineering Directorate.

An explosive train utilizing the M46 Stab Detonator instead of the T37 Stab Detonator was proposed for use with the Fuze, MT, XM563. The fuze will be used with field artillery Beehive type ammunition. Propagation tests were conducted to evaluate the output and establish the reliability of the proposed explosive train.

The proposed explosive train performs satisfactorily within the temperature range from − 65° to + 160°F.

UNCLASSIFIED

1. Fuze – Explosive Train
I. Title
II. Brothers, Jack

UNITERMS

M46 Stab Detonator
T37 Stab Detonator
Fuze, MT, XM563
M564 Fuze
M7 Relay
Propagation Test
Explosive Train
Lead Cup Assembly
Lead Azide
Brothers, J.

UNCLASSIFIED

Accession No. ______________ AD ______________

Picatinny Arsenal, Dover, New Jersey

PROPAGATION TEST OF PROPOSED EXPLOSIVE TRAIN FOR FUZE, MT, XM563

Jack Brothers

Technical Memorandum 1363, February 1964, 13 pp, figures. Unclassified report from the Artillery Ammunition Laboratory, Ammunition Engineering Directorate.

An explosive train utilizing the M46 Stab Detonator instead of the T37 Stab Detonator was proposed for use with the Fuze, MT, XM563. The fuze will be used with field artillery Beehive type ammunition. Propagation tests were conducted to evaluate the output and establish the reliability of the proposed explosive train.

The proposed explosive train performs satisfactorily within the temperature range from − 65° to + 160°F.

UNCLASSIFIED

1. Fuze – Explosive Train
I. Title
II. Brothers, Jack

UNITERMS

M46 Stab Detonator
T37 Stab Detonator
Fuze, MT, XM563
M564 Fuze
M7 Relay
Propagation Test
Explosive Train
Lead Cup Assembly
Lead Azide
Brothers, J.

UNCLASSIFIED

Accession No. ______________ AD ______________

Picatinny Arsenal, Dover, New Jersey

PROPAGATION TEST OF PROPOSED EXPLOSIVE TRAIN FOR FUZE, MT, XM563

Jack Brothers

Technical Memorandum 1363, February 1964, 13 pp, figures. Unclassified report from the Artillery Ammunition Laboratory, Ammunition Engineering Directorate.

An explosive train utilizing the M46 Stab Detonator instead of the T37 Stab Detonator was proposed for use with the Fuze, MT, XM563. The fuze will be used with field artillery Beehive type ammunition. Propagation tests were conducted to evaluate the output and establish the reliability of the proposed explosive train.

The proposed explosive train performs satisfactorily within the temperature range from − 65° to + 160°F.

UNCLASSIFIED

1. Fuze – Explosive Train
I. Title
II. Brothers, Jack

UNITERMS

M46 Stab Detonator
T37 Stab Detonator
Fuze, MT, XM563
M564 Fuze
M7 Relay
Propagation Test
Explosive Train
Lead Cup Assembly
Lead Azide
Brothers, J.

UNCLASSIFIED

Accession No. ______________ AD ______________

Picatinny Arsenal, Dover, New Jersey

PROPAGATION TEST OF PROPOSED EXPLOSIVE TRAIN FOR FUZE, MT, XM563

Jack Brothers

Technical Memorandum 1363, February 1964, 13 pp, figures. Unclassified report from the Artillery Ammunition Laboratory, Ammunition Engineering Directorate.

An explosive train utilizing the M46 Stab Detonator instead of the T37 Stab Detonator was proposed for use with the Fuze, MT, XM563. The fuze will be used with field artillery Beehive type ammunition. Propagation tests were conducted to evaluate the output and establish the reliability of the proposed explosive train.

The proposed explosive train performs satisfactorily within the temperature range from − 65° to + 160°F.

UNCLASSIFIED

1. Fuze – Explosive Train
I. Title
II. Brothers, Jack

UNITERMS

M46 Stab Detonator
T37 Stab Detonator
Fuze, MT, XM563
M564 Fuze
M7 Relay
Propagation Test
Explosive Train
Lead Cup Assembly
Lead Azide
Brothers, J.

UNCLASSIFIED

Accession No. ______________ AD ______________

Picatinny Arsenal, Dover, New Jersey

PROPAGATION TEST OF PROPOSED EXPLOSIVE TRAIN FOR FUZE, MT, XM563

Jack Brothers

Technical Memorandum 1363, February 1964, 13 pp, figures. Unclassified report from the Artillery Ammunition Laboratory, Ammunition Engineering Directorate.

An explosive train utilizing the M46 Stab Detonator instead of the T37 Stab Detonator was proposed for use with the Fuze, MT, XM563. The fuze will be used with field artillery Beehive type ammunition. Propagation tests were conducted to evaluate the output and establish the reliability of the proposed explosive train.

The proposed explosive train performs satisfactorily within the temperature range from − 65° to + 160°F.

UNCLASSIFIED

1. Fuze – Explosive Train
I. Title
II. Brothers, Jack

UNITERMS

M46 Stab Detonator
T37 Stab Detonator
Fuze, MT, XM563
M564 Fuze
M7 Relay
Propagation Test
Explosive Train
Lead Cup Assembly
Lead Azide
Brothers, J.

UNCLASSIFIED

Accession No. ______________ AD ______________

Picatinny Arsenal, Dover, New Jersey

PROPAGATION TEST OF PROPOSED EXPLOSIVE TRAIN FOR FUZE, MT, XM563

Jack Brothers

Technical Memorandum 1363, February 1964, 13 pp, figures. Unclassified report from the Artillery Ammunition Laboratory, Ammunition Engineering Directorate.

An explosive train utilizing the M46 Stab Detonator instead of the T37 Stab Detonator was proposed for use with the Fuze, MT, XM563. The fuze will be used with field artillery Beehive type ammunition. Propagation tests were conducted to evaluate the output and establish the reliability of the proposed explosive train.

The proposed explosive train performs satisfactorily within the temperature range from − 65° to + 160°F.

UNCLASSIFIED

1. Fuze – Explosive Train
I. Title
II. Brothers, Jack

UNITERMS

M46 Stab Detonator
T37 Stab Detonator
Fuze, MT, XM563
M564 Fuze
M7 Relay
Propagation Test
Explosive Train
Lead Cup Assembly
Lead Azide
Brothers, J.

UNCLASSIFIED

Accession No. ______________ AD ______________

Picatinny Arsenal, Dover, New Jersey

PROPAGATION TEST OF PROPOSED EXPLOSIVE TRAIN FOR FUZE, MT, XM563

Jack Brothers

Technical Memorandum 1363, February 1964, 13 pp, figures. Unclassified report from the Artillery Ammunition Laboratory, Ammunition Engineering Directorate.

An explosive train utilizing the M46 Stab Detonator instead of the T37 Stab Detonator was proposed for use with the Fuze, MT, XM563. The fuze will be used with field artillery Beehive type ammunition. Propagation tests were conducted to evaluate the output and establish the reliability of the proposed explosive train.

The proposed explosive train performs satisfactorily within the temperature range from − 65° to + 160°F.

UNCLASSIFIED

1. Fuze – Explosive Train
I. Title
II. Brothers, Jack

UNITERMS

M46 Stab Detonator
T37 Stab Detonator
Fuze, MT, XM563
M564 Fuze
M7 Relay
Propagation Test
Explosive Train
Lead Cup Assembly
Lead Azide
Brothers, J.

UNCLASSIFIED

TABLE OF DISTRIBUTION

TABLE OF DISTRIBUTION

		Copy No.
1.	Commanding General U. S. Army Materiel Command Washington 25, D. C. ATTN: AMCRD-DE-W	1-2
2.	Commanding General U. S. Army Munitions Command Dover, New Jersey ATTN: AMSMU-RE-EG	3-4
3.	Commanding Officer Picatinny Arsenal ~~Dover~~, New Jersey ATTN: SMUPA-DR	5
	SMUPA-DR4	6
	SMUPA-DR5	7-11
	SMUPA-DC3	12
	SMUPA-NR	13
	SMUPA-DW2	14
	SMUPA-DW9	15
	SMUPA-DW10	16
	SMUPA-DX1	17-18
	SMUPA-VA6	19-23
4.	Commanding Officer Frankford Arsenal Bridge and Tacony Streets Philadelphia 37, Pennsylvania ATTN: SMUFA-1610	24-25
	SMUFA-6151	26-27
	Library	28-29
5.	Harry Diamond Laboratories Van Ness and Connecticut Avenues Washington 25, D. C. ATTN: Technical Library	30-31
6.	Commandant U. S. Army Ordnance Center and School Aberdeen Proving Ground, Maryland ATTN: AISO-SL	32

TABLE OF DISTRIBUTION (CONT'D)

		Copy No.
7.	Commanding Officer Ammunition Procurement and Supply Agency Joliet, Illinois ATTN: SMUAP-AE	33
8.	Defense Documentation Center Cameron Station Alexandria, Virginia	34-53